PATENT ABSTRACTS OF JAPAN

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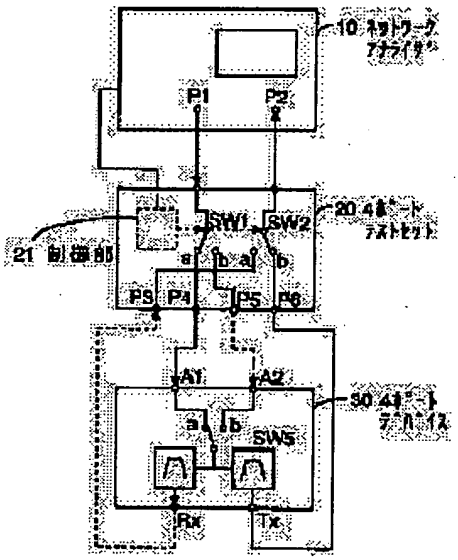
(54) FOUR PORT TEST SET

(57)Abstract:
PROBLEM TO BE SOLVED: To measure the S-parameter of a four port device, without changing cable connection in the middle of measurement, by performing switchover of two switches of a four port test set, by the control signals of a network analyzer.
SOLUTION: A four port test set 20 is composed of switches SW1, SW2, and a control unit 21, and the control unit 21 receives control signals from a network analyzer 10 and performs switchover of the switches SW1, SW2 respectively. And a signal from a port P1 of the analyzer 10 is switched over to a port P4 or port P5 by the switch SW1, and a signal from a port P2 is switched over to a port P3 or port P6. Consequently, it becomes possible to measure the S parameter of a four port device 30, without changing cable connections in the middle of measurement, since a section between each port P3-P6 of the test set 20 and each measuring terminal Rx, A1, A2, Tx of the four port device 30 is all connected with a cable respectively. Accordingly, throughputs of measurement increase.



LEGAL STATUS

[Date of request for examination]

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CLAIMS

[Claim(s)]
[Claim 1] The network analyzer of two ports which can perform S parameter measurement of a device under test, The 1st switch which switches the signal of one port of these two ports to two ports, and makes selection connection, The 2nd switch which switches the signal of the port of another side of these two ports to two ports, and makes selection connection, 4 port test set which possesses the control section which switches and controls said 1st switch and the 2nd switch in response to the control signal of said network analyzer, and can measure 4 port device.
[Claim 2] A network analyzer is 4 port test set according to claim 1 which gives a coincidence indication of eight kinds of S parameters by making a measurement result into four screen display.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to 4 port test set which can measure 4 port device using a network analyzer.
[0002]
[Description of the Prior Art] The example of the conventional technique is explained with reference to drawing 6 - drawing 11 . First, an outline is explained about the network analyzer of two ports. As shown in drawing 7 , the network analyzer 10 of two ports consists of a test section 11, directional couplers D1, D2, and D3, and a switch SW4.
[0003] A test section 11 has the signal output P, reference signal input channel R, and two input channels A and B.
[0004] The directional coupler D1 distributed the signal output p, and has given the reference signal input to Channel R. Moreover, the directional coupler D2 has given the reflective signal and the transmission signal from the device under test connected to the port P1 to Channel A. And the directional coupler D3 has given the reflective signal and the transmission signal from the device under test connected to the port P2 to Channel B. And the S parameter of 2 port device 40 is measured.
[0005] Here, the port of the device under test by which set to 1 the port of the device under test by which cable splicing was carried out to the port P1 side, and cable splicing was carried out to the port P2 side is set to 2. Moreover, Sij of an S parameter is i. The port number to which a signal comes out from a device under test is expressed, and it is j. Close [of a signal] expresses the port number which goes with the device under test.
[0006] For example, when a switch SW4 is made into the a side, S parameter measurement of 2 port device 40 is as follows.
The signal to the signal / channel R to the S11= channel A
The signal to the signal / channel R to the S21= channel B
[0007] Moreover, when a switch SW4 is made into the b side, S parameter measurement of 2 port device 40 is as follows.
The signal to the signal / channel R to the S12= channel A
The signal to the signal / channel R to the S22= channel B
Therefore, the S parameter of 2 port device 40 can be measured, although cable splicing is changed and it drops off.
[0008] Next, the case where 4 port device is measured is explained. For example, an example of 4 port device 30 shown in drawing 6 consists of a switch SW5, a band pass filter 31 for sending signals, and a band pass filter 32 for input signals.
[0009] And Terminal Tx is connected to the transmitting amplifier of transmit frequencies f1, it connects with the receiving amplifier of received frequency f2, and an antenna A1 or an antenna A2 chooses Terminal Rx by the transfer switch SW3, and it is connected. Generally, a different frequency from transmit frequencies f1 and received frequency f2 is set up.
[0010] When measuring this 4 port device 30, as shown in drawing 8 - drawing 9 , the switch switch SW3 is switched. As for drawing 9 between A1-Tx(es), drawing 10 of drawing 8 between A1-Rx(es) is a cable chart where drawing 11 between A2-Tx(es) carries out measurement between A1-Rx(es).
[0011] And a switch SW3 is made into the a side between A1-Tx(es) and between A1-Rx(es), a switch SW3 is made into the b side between A2-Tx(es) and between A1-Rx(es), and they measure S parameters S11, S12, S21, and S22, respectively. Therefore, when measuring 4 port device, it is necessary to change cable splicing 4 times.

[0012]
[Problem(s) to be Solved by the Invention] Like the above-mentioned explanation, when the S parameter of 4 port device was measured with the network analyzer of two conventional ports, there was practical inconvenience whose throughput of measurement needs to change cable splicing 4 times, therefore cannot improve. Then, this invention was made in view of such a problem, and the purpose is in offering 4 port test set which can be measured without modification of cable splicing, when carrying out S parameter measurement of 4 port device with a network analyzer.
[0013]
[Means for Solving the Problem] Namely, the 1st of this invention made in order to attain the above-mentioned purpose The network analyzer of two ports which can perform S parameter measurement of a device under test, The 1st switch which switches the signal of one port of these two ports to two ports, and makes selection connection, The 2nd switch which switches the signal of the port of another side of these two ports to two ports, and makes selection connection, 4 port test set which possesses the control section which switches and controls said 1st switch and the 2nd switch in response to the control signal of said network analyzer, and can measure 4 port device is made into the summary.
[0014] Moreover, 4 port test set of the 1st publication of this invention which, as for the network analyzer of this invention made in order to attain the above-mentioned purpose, the 2nd makes a measurement result four screen display, and gives a coincidence indication of eight kinds of S parameters is made into the summary.
[Embodiment of the Invention] The gestalt of operation of this invention is explained in the following example.
[0015]
[Example] The example of this invention is explained with reference to drawing 1 - drawing 6 . This invention which measures 4 port device 30 has the composition of having added 4 port test set 20 to the conventional network analyzer 10, as shown in drawing 1 .
[0016] About the configuration of a network analyzer 10 and 4 port device 30, since it explained in the conventional technique, it omits.
[0017] 4 port test set 20 consists of switches SW1 and SW2 and a control section 21. Switches SW1 and SW2 use a solid state switch. A control section 21 carries out control which switches switches SW1 and SW2 in response to the control signal from a network analyzer 10, respectively.
[0018] The signal from the port P1 of a network analyzer 10 is switched to ports P4 or P5 with a switch SW1, and the signal from a port P2 is switched to ports P3 or P6 with a switch SW2.
[0019] And as shown, for example in drawing 1 , the cable splicing of between each ports P3, P4, P5, and P6 of 4 port test set, the sense terminals Rx, A1, and A2 of 4 port device, and Tx is carried out altogether, respectively. In addition, although the cable shown by the dotted line in drawing 1 - drawing 4 is not related to actual measurement, it does not influence measurement in the condition [having connected], either.
[0020] As shown in drawing 1 , the switch SW1 of 4 port test set is turned on the a side, SW2 is made into the b side, and S parameter measurement between A1-Tx(es) is performed by making SW5 of 4 port device 30 into the a side.
[0021] As shown in drawing 2 , the switch SW1 of 4 port test set is turned on the a side, SW2 is made into the a side, and S parameter measurement between A1-Rx(es) is performed by making SW5 of 4 port device 30 into the a side.
[0022] As shown in drawing 3 , the switch SW1 of 4 port test set is turned on the b side, SW2 is made into the b side, and S parameter measurement between A2-Tx(es) is performed by making SW5 of 4 port device 30 into the b side.
[0023] As shown in drawing 4 , the switch SW1 of 4 port test set is turned on the b side, SW2 is made into the a side, and S parameter measurement between A2-Rx(es) is performed by making SW5 of 4 port device 30 into the b side.
[0024] As mentioned above, the S parameter of 4 port device 30 is in the middle of measurement, and since it can do without changing cable splicing, the throughput of measurement can be raised.
[0025] Moreover, as shown in drawing 5 , a network analyzer 10 indicates eight kinds of S parameters by coincidence by making a measurement result into four screen display.
[0026] For example, the data of the measurement result of 4 port device 30 display S11 and S21 of A1-Tx, S22 and S12 of A1-Tx, S11 and S21 of A2-Rx, and S22 and S12 of A2-Rx.
[0027] In 4 port device 30, the property of S parameters each suits in relation to mutual without changing independently. That is, when the property of one of the 4 port devices 30 is improved, the property of another side may deteriorate. Therefore, a property comparison mutual by expressing eight kinds of S parameters to coincidence as four screens becomes easy, and can examine 4 port device effectively.

[0028]
[Effect of the Invention] This invention is carried out with a gestalt which was explained above, and does so effectiveness which is indicated below. That is, since measurement of the S parameter of 4 port device can be performed without being in the middle of measurement and changing cable splicing, the throughput of measurement can be raised. Moreover, a property comparison mutual by expressing eight kinds of S parameters to coincidence as four screens becomes easy, and is effective in the ability to examine 4 port device effectively.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] They are 4 port test set of this invention, and the block diagram of 4 port device A1-Tx measurement.
[Drawing 2] They are 4 port test set of this invention, and the block diagram of 4 port device A1-Rx measurement.
[Drawing 3] They are 4 port test set of this invention, and the block diagram of 4 port device A2-Tx measurement.
[Drawing 4] They are 4 port test set of this invention, and the block diagram of 4 port device A2-Rx measurement.
[Drawing 5] It is the display screen of the measurement result of 4 port test set of this invention.
[Drawing 6] It is the example of a block diagram of 4 port device.
[Drawing 7] It is the internal connection Fig. of a network analyzer.
[Drawing 8] They are the conventional 4 port test set and the block diagram of 4 port device A1-Tx measurement.
[Drawing 9] They are the conventional 4 port test set and the block diagram of 4 port device A1-Rx measurement.
[Drawing 10] They are the conventional 4 port test set and the block diagram of 4 port device A2-Tx measurement.
[Drawing 11] They are the conventional 4 port test set and the block diagram of 4 port device A2-Rx measurement.
[Description of Notations]
10 Network Analyzer
11 Test Section
20 4 Port Test Set
30 4 Port Device
40 2 Port Device

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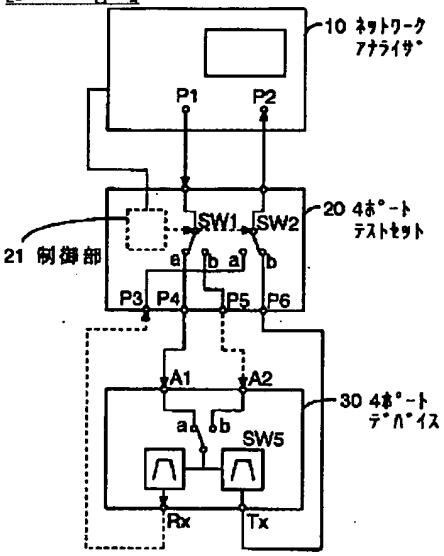
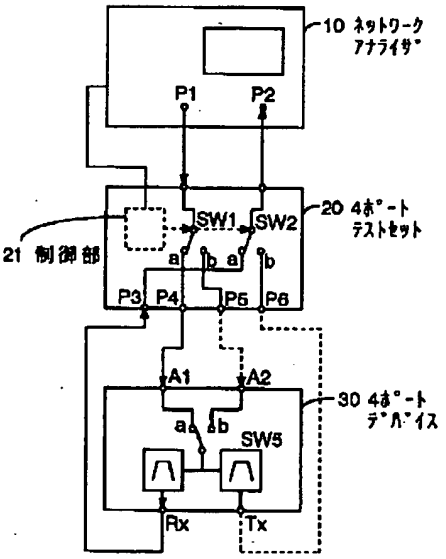
DRAWINGS

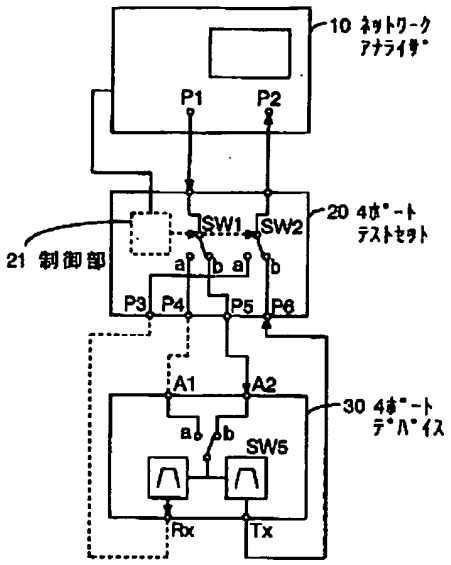
[Drawing 1]



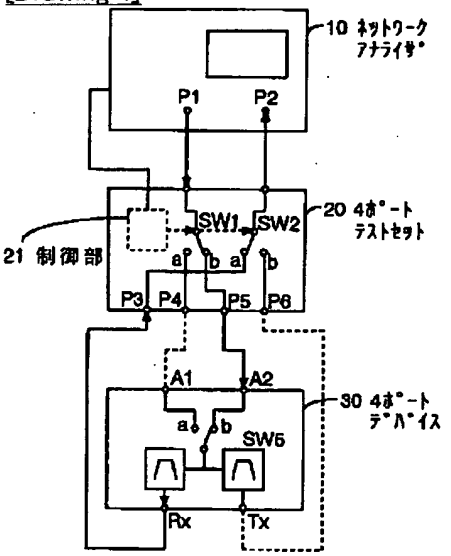
[Drawing 2]



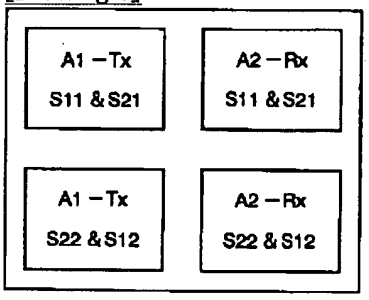
[Drawing 3]



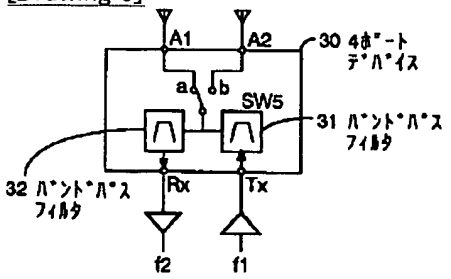
[Drawing 4]



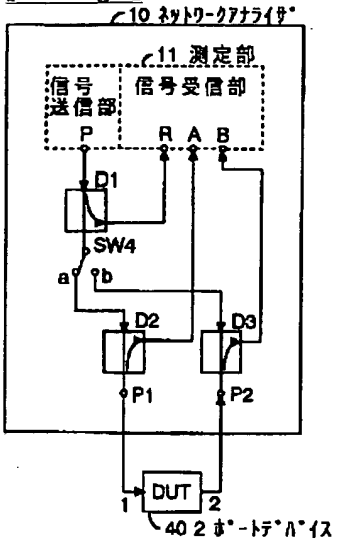
[Drawing 5]



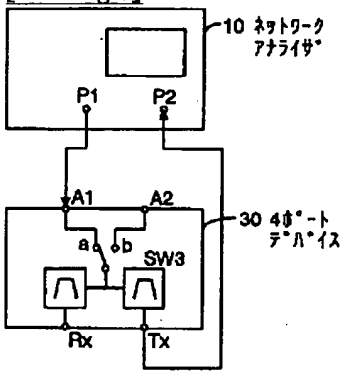
[Drawing 6]



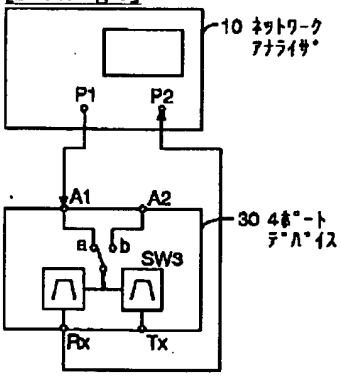
[Drawing 7]



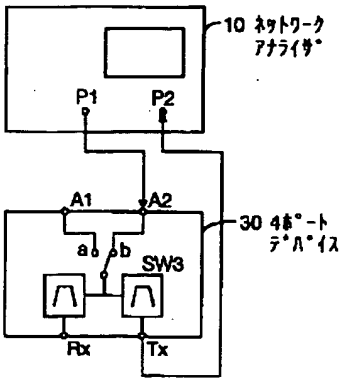
[Drawing 8]



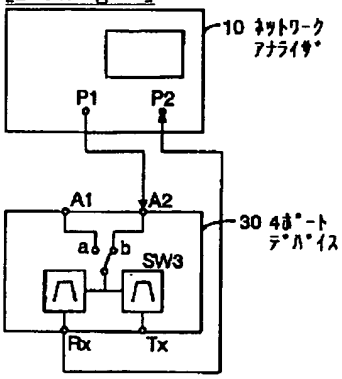
[Drawing 9]



[Drawing 10]



[Drawing 11]



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